

**CAREX MOLESTIFORMIS (CYPERACEAE),
A NEW SPECIES OF SECTION OVALES
FROM THE OZARK MOUNTAIN REGION**

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INTRODUCTION

Recent field research in Arkansas and Oklahoma disclosed the existence of an entity in *Carex* section *Ovalis* that seemed similar to both *C. brevior* (Dewey) Mack. and *C. molesta* Mack. ex Bright, but which differed consistently in several characters. Closer examination of herbarium material and more detailed field work revealed that this plant is a regional endemic within the *C. brevior* group restricted to the Ozark mountain region, in western Arkansas, southern Missouri, and eastern Oklahoma.

Carex section *Ovalis*, a well-defined, species-rich group of about 85 species most diverse in North America, is characterized by gynaecandrous spikes, wing-margined perigynia, distigmatic flowers, and a more or less cespitose habit with true vegetative culms present. The *C. brevior* group is one of the most difficult and poorly understood groups of species within eastern North American members of section *Ovalis*. Diagnostic features of the *C. brevior* group [a major portion of Mackenzie's (1931) "subsection" *Festucaceae*] include medium to large, broadly winged perigynia (mostly ca. 2–6 mm wide and 3.5–8 mm long) with broadly elliptic, broadly ovate, orbicular, or even reniform bodies, and leaf sheaths which usually have a conspicuous hyaline zone on the inner band. The *C. brevior* group presently includes nine entities in eastern North America, *C. bicknellii* Britton var. *bicknellii*, *C. bicknellii* var. *opaca* F. H. Herm., *C. brevior*, *C. festucacea* Willd., *C. hyalina* Boott, *C. merritt-fernaldii* Mack., *C. molesta*, *C. reniformis* (L. H. Bailey) Small, and *C. tetrastachya* Scheele (= *C. brittoniana* L. H. Bailey). Several other species occurring west of the Rocky Mountains and in Mexico may also belong to this group (Mackenzie 1931).

Though close to *C. brevior* and *C. molesta*, this Ozark Mountain region entity clearly possesses a unique combination of morphological features. The inflorescences bear a close resemblance to those of *C. molesta*, compact with few spikes that lack conspicuous staminate bases, but it differs from *C. molesta* in having larger perigynia that are more prominently nerved and with larger achenes. The large achenes are similar to those of *C. brevior*, but *C. brevior* has more elongate inflorescences with more spikes, at least the terminal spike normally conspicuously

clavate due to its prominent staminate base, and perigynia that are nerveless or nearly so adaxially. Because of its distinctive morphology, we describe this entity as a new species, a locally frequent regional endemic.

Carex molestiformis Reznicek & P. Rothr., sp. nov.—TYPE: U.S.A. Oklahoma.

Adair Co.: S bank of Illinois River, just E of bridge for Okla. Hwy 59, ca. 1.5 mi N of Watts, NE 1/4 section 18, T19N R26E, 26 May 1994, A. A. Reznicek 9777 & S A. Reznicek, S. D. Jones, G. D. Jones (holotype: MICH!; isotypes: BRCH! BRIT/SMU! CM! ctb (Herb. Charles T. Bryson)! F! FTG! GENT! GH! K! KANU! KNK! MIN! MO! NLU! NY! OKL! PH! TENN! TEX! UARK! US! VDB! WIS!).

Plantae cespitosae; culmi fertiles 25–120 cm alti; vaginæ basales brunneæ. Culmi vegetativi erecti, annui. Folia 3–5; laminae 2.5–32 cm longae, 1.7–3.8 mm latae; vaginæ ca. 1–10 cm longae, ventraliter membranaceæ, pallide brunneæ vel albidae, hyalinae, laeves. Inflorescentiae 1.2–2.7 (–3.4) cm longae, erectæ, congestæ; spicae 2–4 (–5), gynaecandrae, ovoideæ vel globosae, 7–12 mm longae, 5–10 mm latae, basi staminata 1–5 (–9.5) mm longa. Squamae pistillatae pallide brunneæ, obtusæ vel acutæ. Perigynia 4–5.4 (–6.1) mm longa, (2.4–) 2.6–3.4 mm lata, adpresso-ascendentia, corpibus late ovatis, late ellipticis, vel rotundis, in rostrum serrulatum 1.1–1.9 mm longum contracta. Achenium 1.6–2 mm longum, 1.4–1.8 mm latum, biconvexum. Stigmata 2. Antheræ 3, (1.4–) 1.6–2.6 mm longae.

Cespitose in small clumps from thick, woody, very short-creeping rhizomes; fertile culms 25–120 cm tall, stiffly erect, trigonous, smooth except for finely-scabrous angles just below inflorescence; bladeless basal sheaths medium to dark brown, disintegrating into short, dark brown fibers. Leaves 3–5, on lower 1/5–2/5 of the culm; blades 2.5–32 cm long, 1.7–3.8 mm wide, plicate, glabrous or papillose adaxially, the margins and midrib antrorsely scabrous distally; leaf sheaths ca. 1–10 cm long, tightly enveloping culms, smooth, yellow-green, the intervenal areas ± white with scattered septa; the inner band of sheaths glabrous, its apex concave or truncate and reaching from the base of the blade to 1.5 mm above, light brown to whitish, sometimes brown-tinged at the summit, hyaline; ligules 1–2.8 mm long, rounded, the free portion entire and up to 0.5 mm long. Vegetative culms different from fertile, fully developed only after perigynia are largely shed, annual, 5–40 cm tall with ca. 9–14 leaves clustered near the apex of the culm. Inflorescences 1.2–2.7 (–3.4) cm long, erect or occasionally angled above the lowest spike, the spikes overlapping or congested, the lowest spikes 1.5–6 (–9) mm apart, spikes single at nodes, sessile, lowermost bracts scalelike or setaceous, 0.4–1.5 cm long, inconspicuous, sheathless, upper bracts much reduced; spikes 2–4 (–5), gynaecandrous, globose to ovoid with rounded or tapered bases, 7–12 mm long, pistillate portion 6–10 mm long, 5–10 mm wide, (10–) 15–40-flowered, staminate portion 1–5 (–9.5) mm long, 1.2–2.5 mm wide, ca. 6–14-flowered. Pistillate scales usually reaching the base or sometimes the middle of the beak, 2.9–4 mm long, 1.1–1.6 mm wide, lance-ovate, concave, obtuse or the upper acute, pale brown with narrow yellow-green or pale brown center and hyaline margins, 1-nerved. Staminate scales 2.6–5 mm long, 1.3–1.8 mm wide, ovate, obtuse or rarely acute, pale brown with hyaline margins, 1-nerved. Perigynia 4–5.4 (–6.1) mm long, (2.4–) 2.6–3.4 mm wide, (1.3–) 1.5–1.9 times as long as wide, appressed-ascending, planoconvex with broadly ovate, broadly elliptic, or orbicular bodies, 2.7–3.5 mm long, (0.9–) 1–1.6 times as long as wide and 1.8–2.7 times as long as beak, widest 1.2–2 mm above

base, broadly thin-winged, wing 0.3–0.8 mm wide, finely serrulate-margined except near base, gradually and symmetrically contracted into beak, deep green to brownish (overmature), with paler margins, smooth, leathery, sessile, sharply (3–) 4–7-nerved adaxially over achene, 6–9-nerved abaxially over achene and 1–2-nerved in the winged margin; beaks 1.1–1.9 mm long, strongly flattened and serrulate-margined to apex, the apex bidentate with scabrous-margined teeth 0.1–0.5 mm long, distance from summit of achene to tip of beak 1.7–2.6 (–2.9) mm long. Achenes 1.6–2 mm long, 1.4–1.8 mm wide, 1–1.3 times as long as wide, biconvex, broadly oval to orbicular, pale brown to brown, short-stipitate at base, apiculum 0.1–0.45 mm long; style straight; stigmas 2. Anthers 3, (1.4–) 1.6–2.6 mm long. Chromosome number: $n = 37$.

ADDITIONAL SPECIMENS EXAMINED. U.S.A. ARKANSAS. BAXTER Co.: from White River on Push Mountain Road, about 1 mi S, then left on second gravel road at this point for 2.3 mi to Rough Hollow Creek, section 25, T18N R13W, 14 May 1990, Hyatt 2887.03 (MICH, UARK); from Mtn. Home P.O. 4 mi W on U.S. Hwy. 412 to Baxter Co. Rd. 6, then 1 mi N to 100 m past Kirby-Tucker Cemetery, 10 May 1993, Hyatt 5310 (MO); Mountain Home, about 7 mi N on Ark. Hwy 201, Pigeon Creek near Lake Norfolk, SW 1/4 of SW 1/4 section 9, T20N R13W, 15 May 1993, Hyatt 5342 (GA, MICH); 5345 (MICH, VSC); Gamaliel Post Office, 3.3 mi E on Bx. Co. Rd 46, then 0.3 mi E on Bx. Co. Rd. 43 to creek, SW 1/4 of SW 1/4 section 20, T21N R 11W, 22 May 1993, Hyatt 5485 (MICH, MO); Norfolk, confluence of White and Norfolk Rivers then 100 m downstream, section 20, T18N R12W, 7 June 1993 Hyatt 5624 (MICH, UARK); Henderson Use Area on Lake Norfolk in cove behind causeway upstream from boat dock area, NE 1/4 of SW 1/4 section 27, T20N R12W, 24 June 1993, Hyatt 5708 (MICH). BOONE Co.: Harrison, Harrison High School Property, Baker Prairie, 3 May 1991, Hyatt 3848.05 (MICH, UARK); right-of-way of US 62 about 2.7 mi W of the Marion County line and just E of Harmon, section 17, 20 May 1994, Thomas 135746 & Amazon (ctb - herbarium of Charles T. Bryson). CARROLL Co.: SW 1/4 of NW 1/4 section 27, T18W R23W, 24 May 1992, Hyatt 4388.08 (MICH, UARK). CLEBURNE Co.: Sandiff, SW 1/4 of NE 1/4 section 25, T12N R12W, 8 May 1993, Hyatt 5272 & Hyatt, Beer (MICH, UARK). FULTON Co.: Vidette Community, S of center of section 2, T20N R11W, 22 May 1993, Hyatt 5489 (MICH, MO, UARK); Salem, at Civic Center Lake (=about 1 mi W of the U.S. Post Office), SE 1/4 section 21, T20N R8W, 12 May 1992, Hyatt 4308.25 (MICH, UARK). GARLAND Co.: In triangle of junct. Ark. Hwy 171 & 290 and large stream, NE corner sect 6, T4S R18W, just E of Lake Hamilton, 17 May 1993, Reznicek 9296 & Reznicek, Rothrock, Bryson, Hyatt (MICH, UARK); Rothrock 2904 & Reznicek, Reznicek (MICH, chromosome voucher $n = 37$). INDEPENDENCE Co.: Oil Trough, Ark. Hwy 932 at White River, 29 May 1993, Hyatt 5557 & Bishop (MICH, UARK). IZARD Co.: 1.1 mi E of Moccasin Creek (and Baxter Co. line) on Ark. Hwy 5, 29 May 1992, Hyatt 4606.33 (MICH, UARK); along gravel rd and along Moccasin Creek, 0.8 mi SE of Baxter Co. line and Ark. Hwy 5, NW 1/4 section 7, T17N R11W, 2 June 1992, Hyatt 4612.33 (MICH, UARK); Calico Rock, at White River boat access, 3 May 1992, Hyatt 4833.33 (MICH, UARK); Calico Rock, from railroad 6.3 mi N on Ark. Hwy 5, SW 1/4 section 6, T17N R11W, 10 May 1993, Hyatt 5309 (MICH, UARK); Sylamore, Ark. Hwy 9 bridge at White River, 27 May 1993, Hyatt 5550 (MICH, MO, NO); about 4.5 mi west of Ark. Hwy. 9 on Knob Creek Rd at bridge over Knob Creek, E 1/2 section 31, T17N R9W, 4 June 1993, Hyatt 5596 (MO, UAM); Moccasin Creek, about 1 mi S of Ark. Hwy 5, NE 1/4 of NW 1/4 section 7, T17N R11W, 7 June 1993, Hyatt 5623 (MICH, NA); Cedar glade beside Ark. 9, about 11.9 mi N of White River and Sylamore SW of Melbourne, section 16, 20 May 1994, Thomas 139152 & Amazon (ctb); along dirt rd from Lovelady's Boat Dock and White River up wooded valley N of Guion and Ark. 58, section 22, 21 May 1994, Thomas 139187 & Amazon (ctb). MADISON Co.: Around pond next to Ark. Hwy 295, 1.5 mi SW of Crosses, 20 May 1989, Stewart 89–30 (UARK). MARION Co.: Buffalo River State Park, Hills above Buffalo River, P.O. Yellville, 14 May 1972, Demaree 64832 (MO); near the Buffalo River ca. 1.8 mi ESE of the town of Rush, SW 1/4 section 11, T17N R15W, 13 May 1977, Smith 3156 (UARK); Buffalo National River, SW 1/4 of SW 1/4 section 31, T18N R13W, 20 May 1993, Hyatt 5459 (MICH, UARK); Buffalo National River, Rush, Buffalo River banks between Rush Creek and Clabber Creek, SW 1/4 section 11, T17N R15W, 6 June 1993, Hyatt 5602 (MICH). MONTGOMERY Co.: 0.3 mi W of Caddo Gap on Ark. Hwy 8, NE 1/4 of NE 1/4 section 13, T4S R25W, 22 April 1995, Hyatt 6291 & Hyatt (MICH). NEWTON Co.: Lost Valley, park yard area and Clark Creek, 8 June 1974, Thompson 309 (NLU); middle area of Sneed Creek, NE 1/4 section 8, T16N R22W, 27 April 1977, Smith 3142 (UARK). POLK Co.: 50 m N on Hwy 71 from its jct. with Polk County Rd 414, N of Hatfield, 13 May

1990, Jones & Jones 4653 (MICH); 0.4 mi NE of center of Hatfield on both sides of US 71, SW 1/4 section 13, T3S R32W, 10.8 mi SW of junct. with Ark. Hwy 88 at Mena, 20 May 1993, Reznicek 9368 & Reznicek, Rothrock (ctb, MICH, UARK, VPI). PULASKI Co.: Little Rock, along E-bound off-ramp from I-440 (Exit 5: Little Rock River Port/Fourche Dam Pike exit), 17 May 1993, Rothrock 2901 & Reznicek, Reznicek, Bryson, Hyatt (MICH, chromosome voucher n = 37), Hyatt 5369 & Rothrock, Reznicek, Bryson (UARK). SCOTT Co.: 6.2 mi NE of Polk Co. line, 2 mi SW of Y City on N side US 71, 20 May 1993, Reznicek 9371 & Reznicek, Rothrock (MICH, UARK). SEARCY Co.: Maumee Access on S side of Buffalo River, SW 1/4 section 12, T16N R16W, 28 May 1995, Hyatt 6463 (MICH); 6468 (KNK); Leslie, 2 mi S on U.S. Hwy 65, NE 1/4 section 2, T13N R15W, 28 May 1995, Hyatt 6473 (MICH). SEVIER Co.: DeQueen, 1.9 mi N on U.S. Hwy 71, section 17, T8S R31W, 23 April 1995, Hyatt 6306 & Hyatt (MICH). SHARP Co.: Evening Shade, about 2–3 air mi NE, at NW 1/4 of SE 1/4 section 24, T17N R6W at Ark. Game & Fish Commission Access to Strawberry River, 25 May 1996, Hyatt 7149 (MICH, UARK). STONE Co.: Mountain View, Sylamore Ranger Station of the Ozark National Forest, 19 May 1993, Hyatt 5454 (GA, MICH); Ozark National Forest, Sylamore Ranger District, logging rd in valley due W of Livingston Creek/Partee Springs pull-off along Ark. Hwy 5, center of NW 1/4 of section 26, T16 N R11W, 26 May 1993, Hyatt 5526 (MICH, UARK); Ozark National Forest, Sylamore Ranger District, along Sylamore Trail at first fields below campgrounds, SW 1/4 of SW 1/4 section 3, T15N R11W, 27 May 1993, Hyatt 5547 (MICH, MO). VAN BUREN Co.: E side Ark. Hwy 27 just N of junct. with Co. Rd. 234 (at Una), 1.5 mi S of Searcy Co. line, near center of section 10, T12N R17W, 20 May 1993, Reznicek 9392 & Reznicek, Rothrock (MICH); Fairfield Bay, SW 1/4 section 9, T11N R12W, 8 May 1993, Hyatt 5295 & Hyatt, Beer (UARK); 5298 (MICH, MO, VSC). WASHINGTON Co.: 2 mi NW of U. Campus, 28 May 1921, J.N.B. (UARK); Fayetteville, 23 May 1949, Moore (UARK); Farmington, 9 May 1950, French 477 (UARK); just W of the Art Dept. Annex (Parking Lot 19), U. of A. Campus in Fayetteville, 17 May 1982, Smith 3678 (UARK); Springdale, E side of northbound ramp onto I-71 off eastbound I-412, 26 May 1994, Reznicek 9793 & Reznicek, Jones, Jones (BRCH, DAO, KANU, KNK, MICH, MO, UARK, VDB). COUNTY UNKNOWN: NW Arkansas, June 1880, Harvey (UARK); May 1883, Harvey (UARK).—MISSOURI. HOWELL Co.: on the Eleven Point River, T25N R7W, section 2, on farm rd 200 bridge crossing, 1 June 1990, Summers 3265 (MO); 4 mi S of Caulfield, T22N R10W section 19, 6 June 1990, Summers 3276 (MO). OREGON Co.: 3 mi S of Billmore, Billmore Quad., T22N R2W section 29, 13 May 1990, Summers 3191 (MO) 4 1/2 mi N of Greer, T25N R4W section 23/24, 20 May 1992, Summers 5034 (MO). PULASKI Co.: 3 mi S of Big Piney, T34N R11W, section 24, 3 June 1991, Summers & Ryan 4450 (MO). REYNOLDS Co.: along County Rd 700 on E side of Dry Valley, ca. 3 rd mi NW of junction with State Hwy 21, ca. 4 air mi NW of Ellington, T30N R01E NW 1/4 SW 1/4 SW 1/4 section 7, 16 May 1993, Yatskievych & Yatskievych 93–67 (MO). SHANNON Co.: On Hwy 19 at Currant River Bridge, E side, 23 May 1974, Castaner 3654 & Bevard (WARM).—OKLAHOMA. ADAIR Co.: N side Okla. Hwy 62, 0.1 mi NW of Hwy 51 jct., Eldon, ca. 8 mi E of Tahlequah, N edge section 27, T17N R23E, May 26 1994, Reznicek 9785 & Reznicek, Jones, Jones (MICH). DELAWARE Co.: US 59, 3.6 mi N of rt 20 in Jay, 13 May 1980, Huft 1109 & Goodman (OKL); along stream access rd along N shore of Lake Eucha, 1.6 mi E of Okla. Hwy 59/10, SE 1/4 section 25, T22N R23E, May 25 1994, Reznicek 9770 & Reznicek, Jones, Jones (BH, BRCH, MICH, OKL, OKLA). MAYS Co.: Spavinaw State Park, along N bank of Spavinaw Creek on S outskirts of Spavinaw, SW 1/4 section 15, T22N R21E, May 25 1994, Reznicek 9766 & Reznicek, Jones, Jones (BRCH, DUR, MICH (chromosome voucher n = 37), OKL). McCURTAIN Co.: Mountain Fork Campground, N side Okla. Hwy 4 ca. 1 mi SE of Smithville, section 13, T1S R25E, ca. 4.6 mi W of Watson, May 20 1993, Reznicek 9357 & Reznicek, Rothrock, Jones, Jones (BRCH, ctb, DUR, KNK, MICH, MO, OKL, TEX, TRTE).

The range of *Carex molestiformis* (Fig. 1) is confined to the Ozark Mountains of northern Arkansas and adjacent Oklahoma and Missouri, and the Ouachita Mountains in west-central Arkansas and southeastern Oklahoma. Flowering occurs from late March through April, and fruits mature from mid-May to mid-June depending on latitude. The epithet “molestiformis” alludes to the resemblance of this species to *C. molesta*.

An immature collection from Arkansas: Little River Co., White Cliffs, Moore 510127 (UARK) (not mapped) may be this species, but it is too young to identify with certainty. Also, the habitat (chalk cliffs) and the fact that this site is on the coastal plain both would be unusual for *C. molestiformis*. More material is needed from this site.

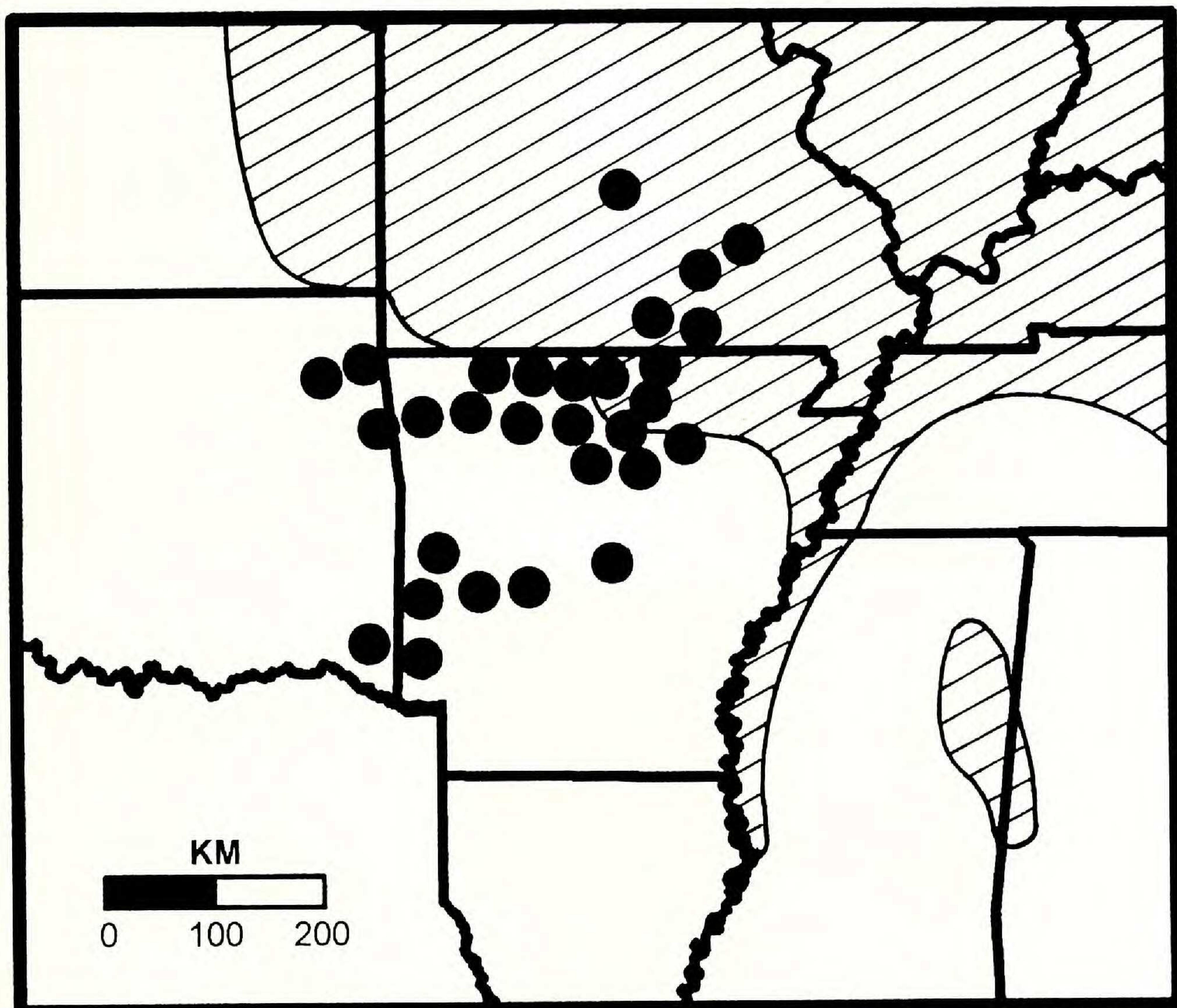


FIG. 1. Distribution of *Carex molestiformis* (dots) in Arkansas, Missouri, and Oklahoma. The hatched area represents the distribution of *C. molesta* within the area covered by this map. *Carex brevior* and *C. festucacea* both occur essentially throughout the region shown on this map (though *C. festucacea* is absent from the far western edge).

DISCUSSION

Even before the recognition of *Carex molestiformis*, the immediate allies of *C. brevior* proved particularly troublesome to systematists. Divergent taxonomic treatments abound. Mackenzie (1931) and many subsequent authors have recognized *C. brevior* and its close allies *C. festucacea*, *C. molesta*, and *C. merritt-fernaldii* as distinct species. Gleason and Cronquist (1991), however, submerged *C. molesta* and *C. merritt-fernaldii* into a broad concept of *C. brevior*, while, somewhat inconsistently, recognizing *C. festucacea*. However, studies by Zager (1991) as well as our own field work, morphological studies (Rothrock 1991), examination of large numbers of herbarium specimens, and chromosome studies (Rothrock & Reznicek 1996b), support Mackenzie's (1931) recognition of *C. brevior*, *C. festucacea*, *C. merritt-fernaldii*, and *C. molesta* as distinct species. In fact, though often misidentified, *C. brevior*, *C. festucacea*, and *C. molesta* are widespread and common species over much of eastern North America, differing consistently in morphology and ecology throughout their ranges without apparent intergradation. Many of the problems botanists have in recognizing the species within this group result from vague and generalized descriptions, which lack clear contrasts between species, and from keys that strongly emphasized single features, such as perigynium nervation,

that are not always reliable. The following key, based on a broader range of features, separates all eastern North American members of the *C. brevior* group and outlines the salient diagnostic features of *C. molestiformis*.

KEY TO THE CAREX BREVIOR GROUP IN EASTERN NORTH AMERICA

NOTE: Fully mature perigynia are a prerequisite for keying. Perigynium measurements are best taken from perigynia between 1/3 to 2/3 the way up the spikes. Perigynia become distinctly narrower near the top of the spikes, and the lowermost few perigynia in the spikes are often shorter and wider than usual and sometimes somewhat deformed. Before choosing which lead in the key to follow, several perigynia should be sampled to assess variation in nervation, shape, and size. Dimensions of the larger perigynia and achenes should be used in keying. Inflorescence characters are best taken from inflorescences produced by the first flush of growth in the spring. Many species continue to flower sporadically through the summer, but these later inflorescences tend to be congested, with more numerous spikes with shorter staminate bases, and with the lowermost bracts longer and more leaflike. These late-season inflorescence forms are not accounted for in the key and descriptions, and plants collected late in the season, with all the spring inflorescences missing or shattered, are quite difficult to identify and may be impossible to key.

1. Plants colonial from short-creeping rhizomes; vegetative culms numerous and conspicuous, strongly tristichous with 15–35 leaves when fully developed; achenes 1.6–2 times as long as wide (and 0.9–1.2 mm wide); larger spikes with 5–25 (–30) perigynia. *C. hyalina*.
1. Plants definitely clumping (though rhizomes may elongate with age); vegetative culms few, inconspicuous, and usually with fewer than 15 leaves, thus not strikingly tristichous; achenes 1–1.6 times as long as wide (and 0.9–2.2 mm wide); larger spikes with ca. 15–80 perigynia.
 2. Perigynia finely granular-papillose (30–40×), the body reniform, 0.6–0.9 times as long as wide (and 3.2–4.9 mm wide); lower pistillate scales obtuse-rounded. *C. reniformis*.
 2. Perigynia smooth, the body broadly ovate, broadly elliptic, ± orbicular, or rarely slightly obovate, (0.7–) 0.9–1.6 times as long as wide (and 1.5–6.1 mm wide); lower pistillate scales obtuse to acuminate.
 3. Larger perigynia 2.5–5.5 mm long, 1.5–3.6 mm wide, with beaks 0.8–1.5 (–1.9) mm long; perigynia plumply planoconvex or concavo-convex, the bulge formed by the achene prominent only on the dorsal face (except in *C. bicknellii* var. *bicknellii*, with papillose sheaths).
 4. Leaf sheaths finely papillose at high magnification (30–40×); perigynia membranaceous and translucent, the dark achene ± visible through the adaxial face of the perigynium; usually at least some perigynia with the wings and base of beak ± erose, scalloped, or even with an irregular tooth and not symmetrically tapered.
 5. Perigynia distinctly 4–7-nerved over the achene on the adaxial face, (4.5–) 5–5.5 mm long, wings usually strongly coppery-tinged; pistillate scales usually reddish brown; anthers (2.5–) 2.9–4.1 mm long. *C. bicknellii* var. *bicknellii*.
 5. Perigynia nerveless or faintly and irregularly 1–5-nerved over the achene on the adaxial face, 3.6–4.8 (–5.2) mm long; wings and pistillate scales yellowish tinged; anthers 1.3–2.6 mm long. *C. merritt-fernaldii*.
 4. Leaf sheaths smooth; perigynia leathery, opaque, with the wings and base of beak usually finely and evenly serrulate and symmetrically tapered.
 6. Spikes on larger culms (4–) 5–7 (–10), tapered at the base, the terminal one with a conspicuous staminate base; inflorescences typically 2.5–4.5 (–6.5) cm long with the lowest internodes (3–) 5–13 (–23) mm long; perigynium body (0.7–) 0.9–1.2 (–1.3) times as long as wide.
 7. Larger achenes 1.4–1.8 mm wide, (1.6–) 1.7–2 mm long; larger perigynia 3.2–4.7 (–5) mm long, 2.5–3.3 (–3.5) mm wide, nerveless or occasionally faintly 1–5-nerved ventrally. *C. brevior*.
 7. Larger achenes 1–1.35 mm wide, 1.2–1.7 mm long; larger perigynia 2.5–4 (–4.2) mm long, 1.5–2.4 (–2.6) mm wide, mostly 2–4 (–6)-nerved ventrally. *C. festucacea*.
 6. Spikes on larger culms 2–4 (–5) (rarely more), rounded at the base, the terminal one lacking a conspicuous staminate base; inflorescences 1.2–2.7 (–3.6) cm long with the lowest internodes 1.5–6 (–9) mm long; perigynium body (0.9–) 1–1.6 times as long as wide.

- 8. Achenes of larger perigynia 0.9–1.3 mm wide, elliptic to narrowly oblong, 1.3–1.6 times as long as wide, larger perigynia 1.8–2.8 (–3) mm wide, squarrose-spreading at maturity, (25–) 30–80 per spike; widespread. *C. molesta*.
- 8. Achenes of larger perigynia 1.4–1.8 mm wide, broadly oval to ± orbicular, 1–1.3 times as long as wide, larger perigynia 2.6–3.4 mm wide, appressed ascending at maturity, (10–)15–40 per spike; Ozark Mountain region.
C. molestiformis.
- 3. Larger perigynia 5.5–8 (–8.7) mm long, (3.1–) 3.5–6.1 mm wide (except rarely in *C. bicknellii* var. *bicknellii* with papillose sheaths), with beaks (1.4–) 1.6–2.5 (–3.4) mm long; perigynia thin and ± waferlike, ± biconvex around the achene, the bulge often prominent on both faces of the perigynia.
- 9. Larger perigynia (2.8–) 3.2–4.8 mm wide, (2–) 4–7-nerved over achene ventrally (occasionally nerveless); staminate and pistillate scales obtuse to long-acuminate, but the midrib not excurrent as a scabrous awn; larger culms with (3–) 5–7 (–9) spikes.
- 10. Leaf sheaths finely papillose, at least near the apex; perigynia thin, translucent, usually with coppery-tinged wings, the larger (2.8–) 3.2–4.3 mm wide; pistillate scales usually reddish brown; anthers 2.9–4.1 mm long; plants in small clumps (usually <10 culms) in dry to mesic habitats. *C. bicknellii* var. *bicknellii*.
- 10. Leaf sheaths smooth; perigynia ± thickened and opaque, with greenish or pale brown wings, the larger (3.1–) 3.5–4.8 mm wide; pistillate scales pale yellowish brown; anthers 1.8–3.5 mm long; plants in dense, large clumps (up to 200 culms) in wetlands. *C. bicknellii* var. *opaca*.
- 9. Larger perigynia 4–6.1 mm wide, nerveless over achene ventrally, or nearly so; staminate scales (and sometimes the lowermost pistillate scales) with the midrib excurrent as a scabrous awn 0.1–0.9 (–2.4) mm long; larger culms with (2–) 3–4 (–5) spikes.
C. tetrastachya (=*C. brittoniana*).

Collections of *Carex molestiformis* were rare in herbaria before our recognition of it as a distinct entity, although the earliest specimen we have seen was collected in 1880. Specimens in herbaria were usually misidentified either as *C. bicknellii* because of their large perigynia with prominent adaxial nerves or as *C. molesta* because of their few-spiked, congested inflorescences. *Carex bicknellii*, however, is a quite different plant; much larger, with longer, wider, and thinner perigynia and more spikes per inflorescence. The real affinities of *C. molestiformis* are with *C. brevior* and its close allies *C. festucacea* and *C. molesta*. A morphological comparison of these three species with *C. molestiformis* is presented in Table 1. *Carex molestiformis* is easily distinguished from *C. festucacea* by its larger perigynia and achenes, and by its short, congested, few-spiked inflorescences. *Carex molestiformis* shares with *C. molesta* perigynia that are usually distinctly longer than wide, several-nerved over the achene adaxially, and few-spiked, short, congested inflorescences, with the spikes lacking a conspicuous staminate base (though the staminate base in *C. molestiformis* is often longer than that of *C. molesta*). *Carex molestiformis* is similar to *C. brevior* in its large and especially wide achenes, large anthers, and relatively few appressed-ascending perigynia per spike; however, *C. molestiformis* is in no way intermediate between *C. brevior* and *C. molesta*. Rather, it shares some features found in *C. brevior* and some found in *C. molesta* but also has unique characters. Among its close relatives, it has the largest perigynia but also, on average, the fewest spikes. The adaxial nervation of *C. molestiformis* is more prominent than in any of its close relatives, and the perigynia tend to be a deeper green color at full maturity. Robust culms of *C. molestiformis* also tend to be quite stout (above the uppermost leaf sheaths) though rather soft; occasionally as much as 3 mm wide when flattened by pressing, a feature not seen in any other species in the *C. brevior* group. The perigynium and achene features noted for the four species treated in Table 1 are illustrated in Fig. 2.

Additional strong evidence for the distinctness of *Carex molestiformis* from both *C. brevior* and *C. molesta* comes from chromosome numbers. The chromosome

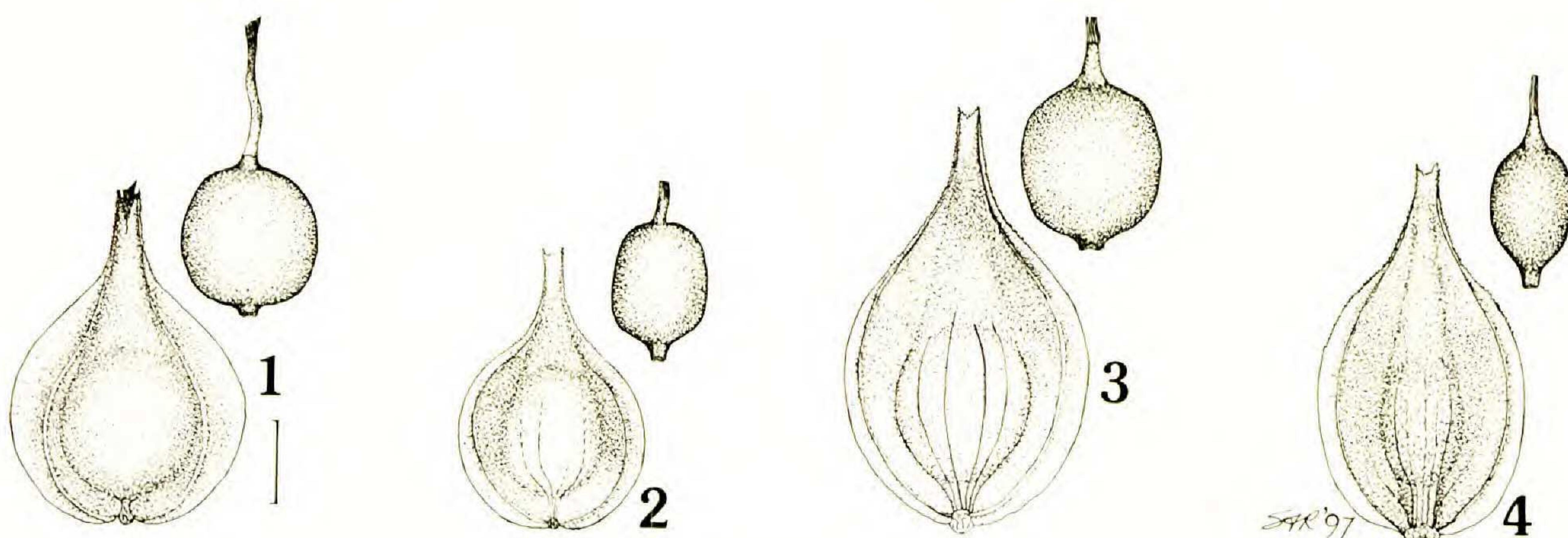


FIG. 2. Perigynia and achenes (above and to the right) of 1) *Carex brevior* (from Bryson 11416, MICH); 2) *C. festucacea* (from Reznicek 9778, MICH); 3) *C. molestiformis* (from Reznicek 9776, MICH); and 4) *C. molesta* (from Wilson 4046, MICH). Scale bar = 1 mm.

count of *C. molestiformis* was determined as $n = 37$ in plants from Garland Co., Arkansas (Rothrock 2904, reported as “*C. cf. brevior*” by Rothrock & Reznicek, 1996b); Pulaski Co., Arkansas (Rothrock 2901); and Mays Co., Oklahoma (Reznicek 9766). In contrast, the chromosome count for *C. molesta* is $n = 34$ (Wahl, 1940; Löve & Löve, 1981; unpublished data) or $n = 35$ (unpublished data). *Carex brevior* also has fewer chromosomes than *C. molestiformis*, with $n = 34$ (Löve & Löve 1981) or lower (unpublished data).

Carex molestiformis thrives in a wide variety of open to somewhat shaded, mostly ruderal, habitats with a wide range of associates, including ditches, dryish roadsides, river and stream banks, moist meadows, and open forests. Soils ranged from clays to loamy silts and sometimes coarser, sandy and gravelly soils along streams. Typically, colonies of *C. molestiformis* rarely occur far from streams, and the most undisturbed habitats in which the species occurs are openings in forested bottoms of rivers and streams with alluvial soils. This may have been the original natural habitat of the species, but it has certainly found disturbed sites suitable for colonization. In these sites, the species can occur with *C. festucacea*, *C. brevior*, and, in northern Arkansas, occasionally *C. molesta*. No intermediates were discovered at any sites where two or more species occurred. Although *C. molestiformis* can co-occur with any of the other three species to which it is most similar, all do have certain distinctive ecological preferences. *Carex molesta* is also commonly a ruderal like *C. molestiformis*, and also often occurs near or along streams and in open woodland. However, it often prefers heavy, clayey soils and is definitely more of a calciphile. *Carex brevior* tends to occur in drier sites, often on sandier soils, and rarely in even lightly shaded settings. *Carex festucacea* tends to occur in at least moist, and sometimes quite wet soils, but also rarely in deeply shaded conditions.

Like *Carex ozarkana*, another recently described species of section *Ovales* from the Ozark Mountain region (Rothrock & Reznicek 1996a), *C. molestiformis* was probably much rarer in the past, before large scale human alteration of the landscape generated extensive ruderal habitats.

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TABLE 1. Morphological comparison of *Carex brevior*, *C. festucacea*, *C. molestiformis*, and *C. molesta*. The smaller measurements in parentheses in this table were mostly not used in the key, which emphasizes measuring the larger inflorescences, perigynia, and achenes on a collection. Also, the exceptionally large measurements for perigynium length in *C. molestiformis* and *C. molesta* each came from single exceptional specimens and are not accounted for in the key.

Character	<i>C. brevior</i>	<i>C. festucacea</i>	<i>C. molestiformis</i>	<i>C. molesta</i>
Perigynium length (mm)	(2.9–) 3.2–4.7 (–5)	(2.3–) 2.5–4 (–4.2)	4–5.4 (–6.1)	(3–) 3.3–4.8 (–5.7)
Perigynium width (mm)	(2.1–) 2.5–3.3 (–3.5)	1.5–2.4 (–2.6)	(2.4–) 2.6–3.4	1.8–2.8 (–3)
Perigynium body shape	mostly orbicular, rarely slightly obovate	broadly elliptic to orbicular, rarely slightly obovate	broadly ovate to broadly elliptic, sometimes ± orbicular	broadly ovate to broadly elliptic, sometimes ± orbicular
Perigynium body L/W	(0.7–) 0.9–1.1 (–1.3)	0.9–1.2 (–1.3)	(0.9–) 1–1.6	1–1.6
Adaxial nerves on perigynia	0 (–5, faint)	(0–) 2–4 (–6)	(3–) 4–7	(0–) 3–6
Achene width (mm)	(1.2–) 1.4–1.8	(0.95–) 1–1.35	1.4–1.8	0.9–1.3
Staminate and lower pistillate scale apex and color	acute, rust–brown tinged	acute, white–hyaline	obtuse, pale brown	obtuse, pale brown
Anther length (mm)	(1.3–) 1.5–3.2	1–2.1	(1.4–) 1.6–2.6	1.1–2.2
Perigynium aspect in the spikes (at maturity)	appressed–ascending	spreading	appressed–ascending	squarrose–spreading
Number of spikes per inflorescence	(2–) 4–7 (–9)	(3–) 5–7 (–10)	2–4 (–5)	3–4 (–6)
Length of staminate base on terminal spikes (mm)	(2.5–) 3–9 (–14)	(2.5–) 3–9 (–15.5)	1.5–5 (–9.5)	1–4.5 (–6)
Inflorescence density and aspect	usually ± open, sometimes arched or even nodding	± open, sometimes arched	compact, stiffly erect	compact, stiffly erect
Lowest inflorescence node length (mm)	(3–) 6–14 (–23)	(3–) 5–13 (–20)	1.5–6 (–9)	1.5–6 (–8.5)
Inflorescence length (cm)	(1.3–) 2.5–4.5 (–6.5)	(1.5–) 2.5–4.5 (–6)	1.2–2.7 (–3.4)	1.3–2.5 (–3.6)

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LITERATURE CITED

- Gleason, H. A., and A. Cronquist. 1991. *Manual of vascular plants of Northeastern United States and adjacent Canada*. 2d ed. New York: New York Botanical Garden.
- Löve, A., and D. Löve. 1981. Chromosome number reports LXXIII. *Taxon* 30: 829–861.
- Mackenzie, K. K. 1931. Cyperaceae - *Cariceae*. *N. Amer. Flora* 18(1–3): 1–168.
- Rothrock, P. E. 1991. The identity of *Carex alboluteescens*, *C. festucacea*, and *C. longii* (Cyperaceae). *Rhodora* 93: 51–66.
- Rothrock, P. E., and A. A. Reznicek. 1996a. A new species of *Carex* section *Ovales* (Cyperaceae) occurring in the Ozark Mountain Region. *Brittonia* 48: 104–110.
- . 1996b. Documented chromosome numbers 1996: 1. Chromosome numbers in *Carex* section *Ovales* (Cyperaceae) from eastern North America. *Sida* 17: 251–258.
- Wahl, H. A. 1940. Chromosome numbers and meiosis in the genus *Carex*. *Amer. J. Bot.* 27: 458–470.
- Zager, S. C. 1991. Multivariate analysis of the *Carex brevior* group in Iowa. M.A. Thesis, University of Northern Iowa. xiii + 134 pp.